

Q4 Test 3 Review

$$1) \lim_{x \rightarrow 1} x^2 - 4x + 1 = 1^2 - 4(1) + 1 = 1 - 4 + 1 = \boxed{-2}$$

$$2) \lim_{x \rightarrow 0} 3^x + \frac{1}{3^x} - x = 3^0 + \frac{1}{3^0} - 0 = 1 + \frac{1}{1} - 0 = \boxed{2}$$

$$3) \lim_{x \rightarrow 0} \frac{(1+x)^2 - 1}{x} = \frac{1 + 2x + x^2 - 1}{x} = \frac{2x + x^2}{x} = \frac{x(2+x)}{x} = 2+x \quad 2+0 = \boxed{2}$$

$$4) \lim_{x \rightarrow -1} \frac{x+1}{x+2} = \frac{-1+1}{-1+2} = \frac{0}{1} = \boxed{0}$$

$$5) \lim_{x \rightarrow 2} \frac{x^2 - 9}{x^3 - 27} = \frac{2^2 - 9}{2^3 - 27} = \frac{4 - 9}{8 - 27} = \frac{-5}{-19} = \boxed{\frac{5}{19}}$$

$$6) \lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3} = \frac{(x+3)(x-3)}{x-3} = x+3 \quad 3+3 = \boxed{6}$$

$$7) \lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{4 - x} \cdot \frac{\sqrt{x} + 2}{\sqrt{x} + 2} = \frac{x-4}{(4-x)(\sqrt{x}+2)} = \frac{-1}{\sqrt{x}+2} \quad \frac{-1}{\sqrt{4}+2} = \boxed{-\frac{1}{4}}$$

$$8) \lim_{x \rightarrow -1} \sqrt{x^2 - 1} = \sqrt{(-1)^2 - 1} = \sqrt{0} = \boxed{0}$$

$$9) \lim_{x \rightarrow 0} \frac{x^4}{x^3 + 1} = \frac{0^4}{0^3 + 1} = \frac{0}{1} = \boxed{0}$$

$$10) \lim_{x \rightarrow -1} \frac{x^2 + 4x + 3}{x^2 + 5x + 4} = \frac{(x+1)(x+3)}{(x+1)(x+4)} = \frac{x+3}{x+4} \quad \frac{-1+3}{-1+4} = \boxed{\frac{2}{3}}$$

$$11) \lim_{x \rightarrow 1} \frac{1-x}{\sqrt{x}-1} \cdot \frac{\sqrt{x}+1}{\sqrt{x}+1} = \frac{(1-x)(\sqrt{x}+1)}{x-1} = -(\sqrt{x}+1) \quad -(\sqrt{1}+1) = \boxed{-2}$$

$$12) \lim_{x \rightarrow -1} \frac{1+x}{\sqrt{x}+1} \cdot \frac{\sqrt{x}+1}{\sqrt{x}+1} = \frac{(1+x)(\sqrt{x}+1)}{x+1} = \sqrt{x}+1 \quad \sqrt{-1}+1 = \sqrt{0} = \boxed{0}$$

$$13) \lim_{x \rightarrow 3} \frac{9-x^2}{5-\sqrt{x^2+16}} \cdot \frac{5+\sqrt{x^2+16}}{5+\sqrt{x^2+16}} = \frac{(9-x^2)(5+\sqrt{x^2+16})}{25-(x^2+16)} = \frac{(9-x^2)(5+\sqrt{x^2+16})}{9-x^2} = 5+\sqrt{x^2+16}$$

$$5+\sqrt{3^2+16} = 5+\sqrt{25} = \boxed{10}$$

$$14) \lim_{x \rightarrow 16} \frac{4-\sqrt{x}}{16-x} \cdot \frac{4+\sqrt{x}}{4+\sqrt{x}} = \frac{16-x}{(16-x)(4+\sqrt{x})} = \frac{1}{4+\sqrt{x}} \quad \frac{1}{4+\sqrt{16}} = \boxed{\frac{1}{8}}$$

$$\text{LCD } 5x \quad 15) \lim_{x \rightarrow -5} \frac{(5x) \frac{1}{x} + \frac{1}{5}(5x)}{5+x(5x)} = \frac{5+x}{(5+x)(5x)} = \frac{1}{5x} \quad \frac{1}{5(-5)} = \boxed{-\frac{1}{25}}$$

$$\text{LCD } 6x(6+x) \quad 16) \lim_{x \rightarrow 0} \frac{6^{-1} - (6+x)^{-1}}{x} = \frac{\frac{1}{6} - \frac{1}{6+x}}{x} = \frac{\frac{x(6+x) - 6x}{6x^2(6+x)}}{x} = \frac{x^2 + 6x - 6x}{6x^2(6+x)} = \frac{x^2}{6x^2(6+x)} = \frac{1}{6(6+x)} = \boxed{\frac{1}{36}}$$

$$17) \lim_{x \rightarrow 0} \frac{x}{(4+x)^2 - 16} = \frac{x}{16 + 8x + x^2 - 16} = \frac{x}{8x + x^2} = \frac{x}{x(8+x)} = \frac{1}{8+x} = \boxed{\frac{1}{8}}$$

$$18) \lim_{x \rightarrow \infty} \frac{x}{x^2 - 1} = \boxed{0} \quad N < D$$

$$19) \lim_{x \rightarrow \infty} \frac{x^3}{x^2 - 1} = \infty \quad N > D$$

$$20) \lim_{x \rightarrow -\infty} \frac{2x^2}{x^2 - 1} = \boxed{2} \quad N = D$$

$$21) \lim_{x \rightarrow -\infty} \frac{4-x}{x^3 + 1} = \boxed{0} \quad N < D$$

$$22) \lim_{x \rightarrow -\infty} (x-3)^{-2} = \frac{1}{(x-3)^2} = \boxed{0} \quad N < D$$

$$23) \lim_{x \rightarrow \infty} \sqrt{\frac{32x+1}{2x-1}} = \sqrt{\frac{32}{2}} = \sqrt{16} = \boxed{4} \quad N = D$$

$$24) \lim_{x \rightarrow \infty} 5 - \frac{4}{x^4} = 5 - 0 = \boxed{5}$$

$N < D$
↓

$$25) \boxed{-\infty}$$

$$26) \boxed{\infty}$$

$$27) \boxed{-3}$$

$$28) \boxed{-3}$$

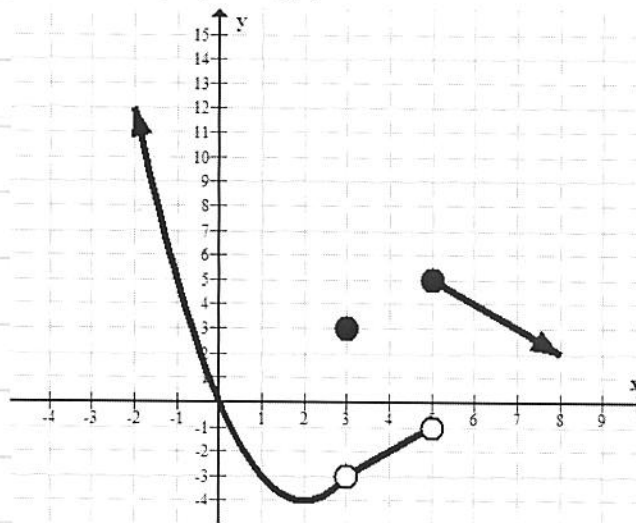
$$29) \boxed{-3}$$

$$30) \boxed{3}$$

$$31) \boxed{-1}$$

$$32) \boxed{5}$$

For questions 25 – 35, use the graph of $f(x)$ provided below.



$$33) \text{ DNE (Left hand limit } \neq \text{ Right hand limit)}$$

$$34) \boxed{5}$$

$$35) \boxed{0}$$